

Summary of Underground Injection Control (UIC) Program Class III Permit Requirements Compared with Nuclear Regulatory Commission (NRC) License Requirements for the Dewey-Burdock Uranium In-Situ Recovery (ISR) Project

Introduction

This document provides a summary of the EPA UIC Class III Permit requirements that are not included in the NRC License in order to evaluate the burden represented by the additional UIC Class III Permit requirements.

Class III Permit Requirements not included in the NRC License:

1. Increased sampling frequency for two additional monitoring wells during a confirmed excursion.
2. Excursion monitoring during the stability monitoring phase for restored wellfields.
3. Geochemical modeling to evaluate the potential for ISR contaminants to endanger USDWs.
4. Additional analytes included on the water quality parameter list.
5. Additional monitoring and geochemical modeling requirement for expanding excursion plumes.
6. Increased frequency for operational monitoring of private wells.

Summary of the Additional Class III Permit Requirements

1. Increased sampling frequency for two additional monitoring wells during confirmed excursion.

The NRC license requires monitoring to detect excursions of injection zone fluids out of the wellfield area at the wellfield perimeter monitoring wells and in monitoring wells completed in aquifers above, and in some cases below, the injection interval. Samples from excursion monitoring wells are analyzed for the three excursion indicators: specific conductance, alkalinity and chloride. An excursion is confirmed when two or more excursion indicators exceed their Upper Control Limit (UCL) or when one excursion indicator reaches a concentration 20% greater than its UCL in a monitoring well. The NRC License requires the sampling frequency for confirmed excursions to increase from 14 days to 7 days in monitoring wells impacted by the excursion. The UIC Class III Permit also requires the 7-day sampling frequency in the two perimeter monitoring wells bracketing the monitoring well(s) impacted by the excursion as shown in Figure 1.

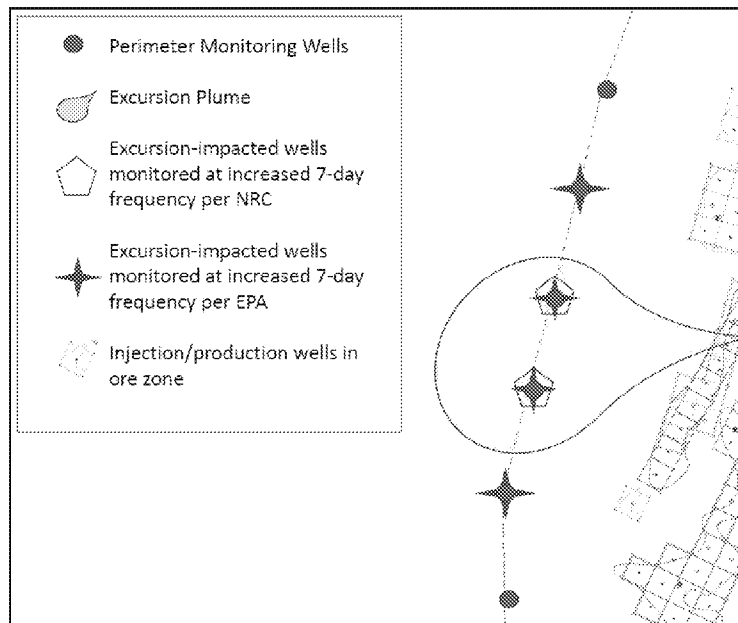


Figure 1. Monitoring Frequencies for Monitoring Perimeter Monitoring Wells during Confirmed Excursion

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2. *Excursion monitoring during the stability monitoring phase for restored wellfields.*

Routine monitoring to detect excursions consists of analyzing monitoring well samples for the three excursion indicators and measuring groundwater levels in each monitoring well. The excursion monitoring wells include the perimeter monitoring ring of wells completed in the injection zone and monitoring wells completed in aquifers above, and in some cases below, the injection interval. The EPA calculates that there would be approximately 815 excursion monitoring wells for the 14 proposed ISR wellfields. Excursion monitoring frequency during ISR operations is every 14 days. Once groundwater restoration begins, the excursion monitoring frequency decreases to every 60 days.

Stability monitoring

- Begins after groundwater restoration has been completed in the ISR wellfield,
- Consists of collecting samples from monitoring wells located inside the ISR wellfield and completed in the injection interval,
- Samples are analyzed for ISR contaminants,
- Is conducted for a minimum of five sampling events bracketing four quarters and
- Continues until ISR contaminants show no statistically significant increase in concentration for four consecutive quarters.

Under the UIC Class III Permit, excursion monitoring continues during the stability monitoring phase at a 60-day sampling frequency.

Powertech commented that the NRC License does not require excursion monitoring during the stability monitoring phase. The NRC License says excursion monitoring is conducted during ISR operations, but that is incorrect. Excursion monitoring must also occur during groundwater restoration.

The NRC Safety Evaluation Report and Powertech's Technical Report for the NRC License state that excursion monitoring continues through groundwater restoration and stability monitoring at a frequency of 60 days. Powertech's Technical Report is part of the License application. The NRC considers both the Safety Evaluation Report and the Technical Report to be enforceable parts of the License. Therefore, there are conflicting NRC requirements related to excursion monitoring during the stability monitoring phase.

The 815 excursion monitoring wells would need to be monitored a minimum of six times during the stability monitoring phase.

3. *Geochemical modeling of restored groundwater in Class III wellfields*

There are three scenarios where groundwater modeling is required under the UIC Class III Permit.

- When the ISR contaminants are restored to pre-mining concentrations wellfield groundwater** a reactive transport model is used to demonstrate long term stability of the restored ISR contaminant concentrations.

There is no equivalent modeling requirement in the NRC license. The NRC relies on data from monitoring wells located inside the wellfield and completed in the injection interval to determine if ISR contaminant concentrations are not showing a statistically significant increase for four consecutive quarters. However, literature reviews have indicated rebound of some ISR contaminant concentrations over time.

Powertech proposed groundwater modeling to replace the additional line of monitoring wells proposed in the first Class III draft Permit. The proposed line of monitoring wells were located inside the aquifer

exemption boundary and downgradient of the wellfield to demonstrate no ISR contaminants will cross the aquifer exemption boundary into the downgradient USDW. Powertech expected to develop one model for each of the three injection intervals in the Dewey Area and the Burdock Area for a total of 6 models for their proposed modeling efforts.

Under the UIC Class III Permit, Powertech would need to develop 14 models, one for each wellfield (four wellfields in the Dewey Area and ten wellfields in the Burdock Area). Each wellfield targets one injection interval. Once the first model is developed, subsequent models would require minor modifications to represent the subsequent wellfields being modeled.

- ii. **When ISR contaminants cannot be restored to pre-mining concentrations.** A reactive transport model is used to evaluate the potential for the elevated contaminant concentrations to cross the aquifer exemption boundary.

The Permittee must also submit a License modification application to the NRC for approval of Alternate Concentration Limits (ACLs) for those ISR contaminants that cannot be restored to pre-mining operations. The operator will need to develop a reactive transport model to include in the License modification application for approval of the ACLs.

We do not think there is an additional burden under the UIC Class III permit for this scenario.

- iii. **When the UIC Class III permit conditions are met for an expanding excursion plume,** a reactive transport model is required to evaluate the potential for the elevated contaminant concentrations to cross the aquifer exemption boundary.

The UIC Class III Permit defines the following criteria for expanding excursion plume:

- a. If, during a confirmed excursion, groundwater sample analyses from either an adjacent unimpacted wellfield perimeter monitoring well or an adjacent non-injection interval monitoring well show concentrations of any two excursion indicator parameters that exceed their respective UCL, as established under the NRC License, or any one excursion indicator parameter exceeds its UCL by 20 percent, the excursion criterion is exceeded in these adjacent monitoring wells and the EPA considers the excursion to be an expanding excursion plume.
- b. If, during a confirmed excursion, groundwater sample analyses from an impacted monitoring wells show the concentrations of the excursion indicators continue to increase over four consecutive sampling periods, the EPA considers the excursion to be an expanding excursion plume

The NRC License does not have a corresponding requirement and does not require groundwater modeling to estimate the extent of the excursion plume. For excursions that are not corrected within 60 days of confirmation, the NRC License requires that either injection in that area of the wellfield ceases or the operator increases the bond to cover the cost of groundwater remediation.

Powertech stated that an expanding excursion plume has not been identified at any ISR operations; therefore, the EPA does not anticipate that these additional requirements will be implemented. These requirements are included mainly to reassure the public in the unlikely event of an uncontrolled excursion that the potential for ISR contaminants to cross the aquifer exemption boundary will be evaluated and remediated.

4. *Additional analytes on Water Quality Parameter list*

The list of water quality parameters in the Class III permit contains 44 analytes while the NRC License criteria contains 35 analytes. Most of the additional analytes are added to support the geochemical groundwater model. The number of well samples on which this list of parameters will be run include:

- i. the initial sample from each of the 815 excursion monitoring wells,
- ii. the four initial samples collected from the 198 wellfield injection zone monitoring wells the NRC License required to determine Commission-approved background concentrations in order to establish the groundwater restoration target concentrations (794 samples),
- iii. the five samples collected from the 198 wellfield injection zone monitoring wells during stability monitoring (992 samples), and
- iv. the quarterly samples collected during the first year from the 10 operational monitoring wells not previously sampled (40 samples).

Over the 17 years projected for the duration of ISR operations and groundwater restoration, that is a total of 2,641 samples that will be analyzed for the 9 additional water quality parameters on the UIC Class III Permit list.

5. *Monitoring of an expanding excursion plume*

If an expanding excursion plume is confirmed, the UIC Class III Permit requires the Permittee to collect samples from all impacted monitoring wells and analyze the samples for each of the 44 parameters in order to develop and calibrate the groundwater model discussed under 3, iii above. The Class III Permit requires that analysis for all 44 parameters continue monthly until excursion indicator concentrations show decreasing concentrations for three consecutive weekly sampling periods.

Because Powertech stated that an expanding excursion plume has not been identified at any ISR operations, the EPA does not anticipate that these additional requirements will be implemented. Therefore, these requirements are included for reassuring the public in the unlikely event of an uncontrolled excursion that the potential for ISR contaminants to cross the aquifer exemption boundary will be evaluated.

6. *Quarterly Operational Monitoring of Private Wells*

The UIC Class III Permit requires sampling of the three private wells on a quarterly basis. The private wells are located downgradient from the Project Boundary. Samples will be analyzed for 35 analytes in the NRC list of water quality parameters annually and for the three excursion indicators the three other quarters in order to verify the private wells have not been impacted by ISR contaminants. If a quarterly sample shows the concentrations of any of the excursion indicators are elevated at a well, then a follow-up sample will be collected and analyzed for the 35 NRC analytes.

The NRC License requires annual operational monitoring of the private wells for the 35 parameters. However, the NRC Safety Evaluation Report states that quarterly monitoring is required.

The UIC Program is reluctant to reduce quarterly sampling of the three downgradient private wells to once per year, but changed in the Final Class III Permit analytical requirements for operational monitoring of the three private wells to analysis of only the three excursion indicators for the three quarters that do not correspond to the NRC License annual sampling event and the annual sampling event to analysis of the 35 NRC analytes, rather than the 44 EPA analytes.

Cost Estimates for Additional Class III Permit Requirements

1. Increased sampling frequency for two additional monitoring wells during a confirmed excursion.

The EPA expects the cost of this additional requirement to be minimal. The additional sampling and analyses will occur in only two additional wells and only during a confirmed excursion rather than the full operational period. Powertech will probably have the capability to analyze the three excursion indicators in the field or in the onsite laboratory for minimal cost.

2. Excursion monitoring during the stability monitoring phase for restored wellfields.

Because of the conflicting requirements in the documents the NRC considers to be included in the License, it is not clear if this requirement in the UIC Class III Permit is actually an additional burden. Because of the staggered development of the ISR wellfield over the life of the project, the 14 wellfields will not be in the same phase of the ISR lifecycle at the same time. As a result, not all 815 excursion monitoring wells will need to be monitored at the same time. The excursion monitoring wells will be monitored during the life of the wellfield rather than for the life of the project. During the stability monitoring period, the sampling frequency for excursion monitoring is reduced from every 14 days during operations to every 60 days. As discussed above, Powertech will probably have the capability to analyze the three excursion indicators in the field or in the onsite laboratory for minimal cost. Powertech has stated that pressure transducers will be installed in each of the excursion monitoring wells to continuously measure the pressure from the water column in each monitoring well. This pressure measurement can be directly correlated to a water level measurement, so this monitoring effort will also be minimal.

3. Geochemical modeling to evaluate the potential for ISR contaminants to endanger USDWs.

The geochemical modeling effort that comprises the largest additional burden for Powertech under the UIC Class III permit is the model for wellfield groundwater restored to pre-mining concentrations as discussed under 3, i above. The UIC Program estimates the cost of the first model to be \$310,240. The 13 subsequent models (one for each wellfield) would cost about 30% of the initial wellfield, including sampling and analytical costs and laboratory work. The reason for this is that subsequent models can be generated by editing the initial model. The total estimated cost for all modeling work is \$1,520,176. That cost distributed over 17 years of operation is \$89,422 per year.

Powertech estimates capital costs of approximately \$157.7 million spread over 17 years for an annual cost of \$923,530. The modeling costs spread over 17 years would add \$89,422 to that annual cost. The Project is estimated to generate net earnings over the life of the project of \$372.7 million (pre-U.S. federal income tax) and \$324.4 million (post U.S. federal income tax). Over the 17 years of operation, post U.S. federal income tax net earnings would be \$19,082,353.

4. Additional analytes included on the water quality parameter list.

The UIC Program calculated the number of groundwater samples over the 17 years projected for the duration of ISR operations and groundwater restoration, to be a total of 2,641 samples that will be analyzed for the 9 additional water quality parameters on the UIC Class III Permit list. The UIC Program does not have an estimate for the analytical cost of the 9 additional analytes on the UIC Class III Permit water quality parameter list.

5. Additional monitoring and geochemical modeling requirement for expanding excursion plumes.

Because Powertech stated that an expanding excursion plume has not been identified at any ISR operations, the EPA does not anticipate that these additional requirements will need to be implemented.

6. *Increased frequency for operational monitoring of private wells.*

There are three private wells located downgradient from the Project Site. The UIC Program has changed the quarterly operational monitoring requirements in the Final Class III Permit to analysis of only the three excursion indicators for the three additional quarters that do not correspond to the NRC License annual sampling event. The Class III Permit now requires the annual operational monitoring samples from the three private wells to analysis of the 35 NRC analytes, rather than the 44 EPA analytes. Since Powertech will probably have the capability to analyze the three excursion indicator in the field or in the onsite laboratory for minimal cost, the UIC Program considers this additional burden to be minimal. The Final Class III Permit also includes a provision that if a private well owner does not consent to having Powertech collect samples from a private well, Powertech does not have to comply with this requirement.